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NOTES AND LITERATURE

North American Early Tertiary Bryozoa. By FERDINAND CANU AND RAY S. BASSLER. Smithsonian Institution. United States National Museum. Bulletin 106. 1920, 879 pages, 279 text figures and 162 plates.

Students of both fossil and recent bryozoa will greet with interest and pleasure this monumental work long anticipated and recently issued, for while treating primarily of fossil bryozoa this monograph contains much of interest to students of living forms. This work appears in two volumes, one containing the text and text figures, the other consisting of photographic plates alone. A cursory inspection reveals the fact that these volumes possess the excellence of copious illustration, a most satisfactory virtue in the eye of those who will use them. The text figures are abundant, the number as stated above (279) by no means giving a true idea of the actual number, since each figure consists of from two to ten or more illustrations, representing portions or organs of the species under discussion, and often besides figures of nearly related species for comparison. From this point of view the number given should be multiplied many times, and by actual count the first fifteen text figures contain more than one hundred separate drawings or preparations. These are all either original with the authors or are taken from the illustrations of other bryozoologists. Each photographic plate likewise contains from twelve to twenty-five separate photographs. These are distinguished by a remarkable clearness and definiteness of outline, even of minute details, revealing an unusually skilful management of light and shade and producing an excellent and expert piece of work which will not fail to call forth the gratitude as well as the admiration of their fellow workers.

Over 700 species belonging chiefly to the two orders, Cyclostomata and Cheilostomata, are treated in this monograph. In the seventy or more pages of introduction the authors present many topics of interest involving new points of view which will doubtless stimulate further research. Of these topics but three will be touched upon.

1. It is gratifying to find clear definition and illustration of

the terms of the more recent nomenclature used in description and classification. The study of the bryozoa has developed to such a degree in recent years and so many new terms have been introduced which are found only in the scattered writings of numerous authors, that a new compilation and exposition similar to the classic work of Hincks in his "British Marine Polyzoa" would be useful. As far as it was compatible with the limits of this treatise such a compilation and exposition have been accomplished here, and both the beginner in the study of the bryozoa and the advanced worker will find great assistance in the discriminating use of the newer anatomical terms.

2. Of the general functions of the bryozoa, of the Cheilostomata especially, the discussion of the hydrostatic function is perhaps the most interesting because it presents the newest and latest views on this puzzling subject. The extrusion and retraction of the polypide, the action of the operculum and of the zoœcial muscles in these activities, and the relation of these to the ingress and egress of water was long a puzzle. Jullien in 1888 first discovered the so-called compensating sack or compensatrix under the dorsal surface of the zoœcium. Since then scattered studies have been made on this organ which was soon found to be present in many species. The present authors have continued this study and following Levinsen (1909) have made the presence or absence of a compensatrix the basis of division of the Cheilostomata into two sub-orders Anasca, without such a compensating sack; Ascophora, possessing such a sack.

In addition to the zoœcial hydrostatic system discovered by Jullien, the senior author, in 1915 discovered a zoarial hydrostatic system in the Anasca. This investigator found that the space under the ectocyst, in certain species lacking a compensatrix, was continuous from zoœcium to zoœcium throughout the colony. Into this space water is introduced or expelled thus compensating for the egress and ingress of the polypides. By such means minute creeping zoaria as the Lunulites, *e.g.*, are enabled to maintain themselves on the algæ on which live.

3. In line with their insistance on the value of function it is not surprising that these authors classify the Tertiary bryozoa on a physiologic rather than a morphologic basis as is the method followed by the older investigators. Believing as they do that (p. 70) "In the bryozoa, as in other living beings, the form is only the result of functions; therefore in the study of

morphological variations of the organs, we now substitute that of the physiologic functions. Our studies are therefore always directed toward the discovery of functions which modify the skeletal form.'' With this frank statement of the primacy of the Lamarckian principle, family, genus and species are thus briefly described:

The family is characterized by the larval form.

One genus differs from another in possessing a different function. The three essential functions of all bryozoa are:

1. Passage of egg and escape of larvæ (= rapport of operculum and ovicell).
2. Hydrostatic system and extrusion of the polypide (= form of the aperture and rapport of operculum with compensatrix).
3. Calcification and chitinization (= nature of the skeletal part and of the frontal considered as deposits of the endocyst).

Specific characters include all morphological variations and all of the characters of adaption.

Whatever philosophic views one may hold in regard to the relation between form and function, it is apparent that the characters chosen for family, genus and species present a uniform, logical system and constitute a good workable plan or hypothesis which it seems more than worth while for all workers in this field to attempt to apply. It must be remembered, however, that while in the class bryozoa, larval characters may afford valid data indicating relationship such characters have failed to afford satisfactory data of relationship among some other class of animals. Granting the validity of the assumption, however, the research necessary to establish this statement can be conducted only on living species. This, then, is a matter of immediate and pressing interest. The older bryozoologists considered the operculum a family character. In the present system the operculum becomes a generic character, changes in it being induced by changes in the essential zoœcial functions 1 and 2, that is, depending in part upon the relation existing between the operculum and ovicell, and in part upon the relation existing between operculum and compensatrix together with the form of the aperture. Here again, although much investigation has been conducted to verify these generic principles among the fossil Tertiary species, work on living forms should be undertaken to discover how far recent species actually conform to the plan proposed.

Identification and description of the species of this collection constitute the main portion of this monograph. A superficial examination of the text reveals the fact that in order to apply these principles to present day bryozoa, momentous and wide spread changes will be necessary. Not only will genera and families be broken up, but many heretofore considered widely separate will be regarded as closely related and vice versa. While one is startled by the number and significance of the changes involved, yet the present morphologic method is so unsatisfactory that this attempt to apply a unitary principle which promises so to simplify classification and to lift it out of chaos, should be heartily welcome. Too high praise cannot be accorded the authors of this monograph for the excellence of this work so full of new and stimulating ideas.

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